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Current Support Brief

MOUNTING COSTS OF THE FRENCH NUCLEAR PROGRAM

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MOUNTING COSTS OF THE FRENCH NUCLEAR PROGRAM

The French nuclear energy program is growing progressively more expensive as a result of its expanding size, unforeseen increases in costs, and greater emphasis on its military aspects. From a modest beginning in 1946, when the budget of the Commissariat à l'Energie Atomique (CEA) amounted to only about $1 million, expenditures have risen to a point at which it is estimated that in 1963 the program will cost more than $800 million.* This figure is about 30 percent higher than the estimated expenditures on the program in 1962 and represents an extension of the trend of the past 4 years.** If this trend continues, annual expenditures will average approximately $1 billion for the period 1963-66 and by 1966 will be approaching $2 billion. This latter figure would represent expenditures in a single year amounting to 80 percent of the $2.5 billion estimated to have been expended on the program in the 17 years from its inception in October 1945 through 1962.*** In spite of the sharp increase in the costs of the nuclear program, these outlays are regarded as well within the capabilities of the French economy.

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* Cost figures in this publication were developed in francs and converted at the official rate of exchange of 1 new franc to $0.2041. Resulting figures have been rounded.

** Expenditures are estimated to have been $190 million in 1958 and $280 million in 1959. Figures for more recent years are shown in the table, p. 2, below. The average annual rate of increase in expenditures during the period 1958-62 is estimated to have been about 35 percent. Expenditures for the nuclear program in years after 1963 have been estimated on the basis of an average annual increase of about 33 percent.

*** More than one-third of the total expenditure of $2.5 billion has been expended for parts of the French nuclear program that are exclusively of a military nature. Most of the remaining expenditures must be regarded as joint costs of military and nonmilitary projects. It is difficult to separate these costs, but it is estimated that at least two-thirds of the total has been associated with military aspects of the program. A functional breakdown of the expenditures through 1962 is shown in the Appendix. Expenditures prior to the detonation of the first atomic device in 1960 are estimated to have been $1.1 billion.

Table

Sources of Funds for the French Nuclear Program
1960-63

	1960 a/	1961 a/	1962 b/	1963 c/
	Million US $			
Budgetary Allocation to Commissariat à l'Energie Atomique (CEA), loans from the Fund for Economic and Social Development (FDES), and income from sales of nuclear products by CEA	224	247	275	325
Transfers from the defense budget	86	200	260	390
Allocation by Electricité de France (EDF) to nuclear power programs, allocations to international agencies, transfer from the Ministry of Public Works, and investment by private industry d/	40	43	90	95
Total	350	490	625	810
	Percent			
Total as percent of GNP e/	0.6	0.8	0.9	1.1

a. Data for 1960 and 1961 were derived from CEA and EDF reports and from budget data. 1/
b. Data for 1962 represent adjustment of authorizations on the basis of preliminary reports of actual expenditures. 2/
c. Based on CEA and defense budget data. The estimate for the third category shown is based primarily on partial budget data for international organizations and on an estimate of the increase in expenditures by the EDF.
d. Only identifiable items have been included. The amount of funds expended by the government for international cooperation in the atomic field and by private industry for investment in new materials and equipment undoubtedly is greater than the amount included above for such expenditures.
e. Based on official French GNP data, in current market prices, as reported in source 3/. GNP for 1963 is estimated on the basis of the average annual increase of 9 percent achieved between 1959 and 1962.

1. Aggregate Costs

There has been a steady rise in expenditures for the French nuclear program. As a share of the French gross national product (GNP), these expenditures on the nuclear program have grown from about 0.6 percent in 1960 to an estimated 1.1 percent in 1963. This latter figure is equal to the share in the GNP of the United States represented by funds appropriated for the US Atomic Energy Commission in 1953, the peak year for the period 1950-62. (In recent years, US Atomic Energy Commission funds have represented about 0.5 percent of the GNP of the United States.) 4/ If present trends continue, the costs of the French nuclear program may equal approximately 2 percent of the French GNP by 1966.

The program has been financed from a wide variety of sources as indicated in the table.* The most significant increase, however, has been in the funds transferred from the defense budget. These funds in 1963 will be nearly double the amount of such transfers in 1961 and must be regarded as indicative of the emphasis on the military aspects of the program.** Among the military aspects of the program to be emphasized in 1963 are (a) production of nuclear weapons to be used with the Mirage IV, (b) research and development for improved weapons technology, (c) development of an atomic test site in the Pacific, (d) further work on the nuclear submarine program, and (e) continued construction on the gaseous diffusion plant at Pierrelatte. 5/

2. Gaseous Diffusion Plant at Pierrelatte

Illustrative of the rising costs of the program have been the steadily increasing expenditures and estimates of probable total cost for the gaseous diffusion plant under construction at Pierrelatte. An initial appropriation of $50 million was made for this plant in July 1957. 6/ At that time it was

* P. 2, above.

** Transfers from the defense budget probably do not include all military expenditures on the nuclear program. Some expenditures on military aspects of the program undoubtedly are treated as normal military expenditures.

estimated that the total cost would be about $120 million. 7/ The plant was originally scheduled for completion in 1963-64, but technical and perhaps financial difficulties have forced postponement. It soon became apparent that the original cost estimates were too low. In fact, the French press has speculated that the first public estimates of cost were cautiously held below the real estimate, lest the cost be regarded as too high. Early research and pilot plant studies alone accounted for $130 million, including $50 million for theoretical and industrial studies, $40 million for prototype studies (barriers and compressors), and $40 million for pilot plants at Saclay and Pierrelatte. 8/ By 1960 the estimate for the entire project had risen to approximately $360 million. 9/

In July 1962 the government asked the National Assembly for a supplemental appropriation of $40 million for Pierrelatte on the grounds that by the end of the year more than $290 million would have been spent and that authorizations amounted to only $250 million. During the course of the debate on the supplemental appropriation, the total cost of Pierrelatte was indicated as about $1 billion. Of the approximately $710 million remaining to be spent, about 66 percent was expected to be for construction and 34 percent for testing and startup.* 12/ Government spokesmen explained the gross underestimation of the cost of Pierrelatte by pointing out that French technicians had to make their estimates on a purely theoretical basis because they had neither experience nor benefit of foreign experience in building such a plant.

In spite of considerable opposition, the supplemental appropriation was approved. On the basis of statements made during the debate on the supplemental appropriation, it is estimated that expenditures on the plant in 1962 totaled about $90 million. M. Dorey indicated that the probable

* The cost of the plant was indicated by M. Dorey (MRP), Special Reporter for the Finance Committee for Military Credits and Certain Operations in the Assembly, as 4,536 million new francs ($926 million) 10/ and by M. Gaston Palewski, Minister of State for Scientific Research and Atomic and Special Questions, as 4,436 million new francs ($905 million). M. Palewski gave the cost of construction as 3,400 million new francs ($694 million), with a margin of error of about 15 percent and the cost of testing and startup as 1,036 million new francs ($211 million). 11/

financing required for the plant in 1963 would be about $130 million. 13/ Six months later, when the budget for 1963 was being discussed, M. Pierre Messmer, Minister of Defense, indicated that the estimate for 1963 had risen to $155 million. 14/ In March 1963, M. Le Theule, Reporter for the National Defense Committee of the Assembly, stated that the cost of the first three parts of the plant alone probably will reach $1 billion and that the cost of the fourth part cannot now be estimated. 15/ (Completion of the latter part is necessary for production of weapons-grade U-235). If the cost of the fourth part of the plant continues to bear the same relationship to the cost of other parts as anticipated in previous French estimates, the total cost of the plant may be about $1.2 billion, approximately 10 times the amount originally estimated. Such an investment is equivalent to more than one-half of the total investment ($2.3 billion) by the United States in its three gaseous diffusion plants, 16/ any one of which is much larger than the plant at Pierrelatte. Compared with the US plants, Pierrelatte therefore represents a very inefficient investment of funds.

APPENDIX

FUNCTIONAL DISTRIBUTION OF ESTIMATED EXPENDITURES ON THE FRENCH NUCLEAR PROGRAM a/ 1946-62

	Million Current US $			
	Capital Investment	Operations	Total	Percentage Distribution
Administration	0	70	70	2.8
Exploration and mining	80	120	200	8.0
Ore concentration plants	20	130	150	6.0
Feed materials plants	30	120	150	6.0
Dual-purpose reactors	200	20	220	8.8
Chemical separation	65	20	85	3.4
Gaseous diffusion plant	290	0	290	11.6
International organization	0	110	110	4.4
Weapons development and fabrication	400	220	620	24.8
Research centers	365	240	605	24.2
Total b/	1,450	1,050	2,500	100.0

a. Estimates were derived largely from data contained in documents listed in source 17/. More detailed definitions and the methodologies for the derivation of individual figures are available in the files of this Office.

b. The figures shown above must be regarded as conservative estimates of expenditures on the program. They do not include the following additional costs: costs incurred for international cooperation in the nuclear energy field beyond contributions to the European Atomic Energy Community (EURATOM), the European Organization for Nuclear Research (CERN), the International Atomic Energy Agency (IAEA), and the European Nuclear Energy Agency (ENEA); investment by private industry in new materials and equipment (except for a few identifiable items); or military expenditures beyond the funds actually transferred from the defense budget to the CEA.

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Analysts: [redacted]

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